approximation to the actual azimuths before the height of the horizon has been measured.

Now, while the summer solstice sun thus rises in different azimuths with different heights of the horizon, its position in the heavens, that is, its declination, is unchanged. It is clear, then, that we cannot, by our azimuth measures alone, obtain the true position of the sun in the heavens, that is, in the celestial sphere. The same remark also applies to every star which rises and sets in the latitude of Britain. In addition to the azimuth of the rising or setting place, *we must also take the height of the horizon into account.* When we do this, the determination of the true position in the heavens, whether of sun or star—the declination—is easy.

As I shall show in the sequel, we have now the means, as the result of astronomical calculations, of determining the dates at which the sun or a star occupied declinations in times past different from those they occupy at present. All the archæologist has to do is to consult certain tables in which the sun's declination at the solstice and the varying declinations of the stars are shown for the past six thousand years. This is enough for the purpose the archæologist has in view.

NORMAN LOCKYER.

THE GROWTH AND SHRINKING OF GLACIERS.[1]

THE interesting publications referred to below show that the study of the fluctuations of glaciers is making good progress. Those of the Swiss Alps have been watched systematically for nearly thirty years, and similar work is now being carried on, not only in all parts of that chain, but also in the Pyrenees, Scandinavia, Bokhara, the Altai, the Tian Shan, and the North American chains, and has been started in the Himalayas. In the European Alps a general retreat of the glaciers began about 1861. At first rapid, it slackened after a time, but, though here and there a glacier has slightly retraced its steps and an advance became more general towards the end of the last century, the majority are still either slowly shrinking or at best stationary. In the French Alps, we learn, sundry small glaciers have quite melted away during the last few years. It is to be hoped that these places will be carefully watched in order to ascertain more precisely the conditions (temperature, precipitation, &c.) under which the formation of a glacier becomes possible. That, as I pointed out in 1894 (see "Ice Work," part iii., ch. i.), would enable us to estimate the mean temperature in certain localities during the Glacial epoch, and thus to obtain one firmer footing in that most slippery subject. This shrinkage of the world's ice mantle, we may add, appears to characterise all the countries observed, for only in Scandinavia, and perhaps at Mount St. Elias, are glaciers beginning to advance in notable numbers.

Prof. Forel contributes to the special report on the Swiss glaciers a valuable discussion on the relations of their changes to the meteorology of the region, founded on observations which have been taken continuously at Geneva for the last eighty years. The advance or retreat of an ice-stream depends mainly on two factors: the annual snowfall and the general temperature, the one chiefly affecting its upper part, the other its lower. The effects, especially of the former, obviously cannot be immediate, and a glacier may continue its advance when the conditions are adverse, or *vice versâ*. As forty-three years elapsed before the relics of members of Dr. Hamel's party, who perished in a crevasse on the Ancien Passage, were discovered on the Glacier des Bossons, after travelling about five and a half miles, we must expect changes and their results to be separated by an interval, depending on the length, slope, and other characters of an ice-stream. It is perhaps too soon to generalise from Prof. Forel's discussion of the Geneva observations, and the distance of that observatory from the higher parts of the chain will always be a drawback; but the results are already suggestive, and his method of smoothing off the irregularities of individual years, by taking the mean of the decade which they close, enables us to form a better estimate of the real climatal changes. Time will render the work of the professor, his coadjutors, and all members of the International Commission increasingly valuable; for this is one of the cases where one generation must plant the tree and another gather the fruit.

T. G. BONNEY.

[1] "Les Variations périodiques des Glaciers." xii^me Rapport, 1906, de la Commission internationale des Glaciers. Résumé par F. A. Forel. *Arch. des Sci. Phys. et Nat. Quatr. Pér.*, t. xxv., pp. 577–587.

"Les Variations périodiques des Glaciers des Alpes Suisses." By F. A. Forel, E. Muret, P. L. Mercanton and E. Argand. 28^me Rapport, 1907. Extrait de l'Annuaire du S.A.C., xliii^me année. Pp. 302–331.

INTERNATIONAL CONFERENCE ON ELECTRICAL UNITS AND STANDARDS.

BY invitation of the British Government an International Conference on Electrical Units and Standards will be held in London at the rooms of the Royal Society during this month. Eighteen countries are sending delegates to the conference; the names are given below.

The first meeting of the conference will be held on Monday, October 12, at 11.30, when the delegates will be received by the President of the Board of Trade; in the evening there will be a reception by the Royal Society. The meetings of the conference are expected to last until October 22, but this date is not fixed, as it will entirely depend on the progress made with the work at the conference.

The main object of the conference is to obtain international agreement on the three electrical units, the ohm, the ampere, and the volt, so that the realisation of these units in all the countries of the world shall be as near as possible identical. The best method of setting up the mercury ohm, the silver voltameter, and cadmium cell will be considered, and it is hoped that detailed specifications may be issued with the authority of the conference.

The delegates will be entertained at an official banquet, and will lunch with the Lord Mayor; they will also make an excursion to Cambridge on the invitation of Trinity College, and pay a visit to the Cavendish Laboratory. The Board of Trade Government Standards Laboratory will be open to inspection by the delegates, and the National Physical Laboratory at Teddington will be visited. The delegates will also dine at the Franco-British Exhibition with the "Dynamicables," and are invited to the annual dinner of the Institution of Electrical Engineers.

List of Delegates.

America (United States).—Dr. Henry S. Carhart, professor of physics at the University of Michigan; Dr. S. W. Stratton, director, Bureau of Standards, Washington; Dr. E. B. Rosa, physicist, Bureau of Standards, Washington.

Belgium.—M. Gérard, director of the Montefiore Electrotechnical Institution and president of the Consultative Commission on Electricity; M. Clément, secretary of the Consultative Commission on Electricity.

Denmark and Sweden.—Prof. S. A. Arrhenius, Nobel Institute, Stockholm.

Ecuador.—Senor Don Celso Nevares, Consul-General.

France.—M. Lippmann, member of the Institute and professor at the Sorbonne.

Germany.—Dr. Warburg, president of the Imperial Physico-technical Institute; Dr. Jaeger, member of the Imperial Physico-technical Institute; Dr. Lindeck, member of the Imperial Physico-technical Institute.

Great Britain.—The Right Hon. Lord Rayleigh, president of the Royal Society; Prof. J. J. Thomson, Cambridge; Sir John Gavey, C.B.; Dr. R. T. Glazebrook, director of the National Physical Laboratory; Major W. A. J. O'Meara, C.M.G., Engineer-in-Chief, General Post Office; Mr. A. P. Trotter, Electrical Adviser to the Board of Trade.

Guatemala.—Dr. Francisco de Arce, diplomatic representative, London and Paris.

Italy.—Prof. Antonio Roiti, of Florence.

Japan.—Mr. Osuke Asano, doctor of engineering, official expert of the Department of Communication, Tokyo; Mr. Shigeru Kondo, official expert of the Department of Communication, Tokyo.

Mexico.—Don Alfonso Castello; Don Jose Maria Perez.

Netherlands.—Dr. H. Haga, professor at the University of Groningen.

Paraguay.—M. Maximo Croskey.

Spain.—Don Jose Maria Madariaga, professor of electricity and physics at the School of Mines, Madrid.

Switzerland.—Dr. F. Weber, professor at the Swiss Polytechnic School at Zürich; Dr. Pierre Chappuis, of Bale; Dr. J. Laudry, professor of electricity in the School of Engineers, Lausanne.

British Colonies: Australia.—Mr. Cecil Darley; Prof. Threlfall.

Canada.—Mr. Ormond Higman, chief electrical engineer, Inland Revenue, Ottawa.

Crown Colonies.—Major P. Cardew, electrical adviser.

India.—Mr. M. G. Simpson, electrician of the Indian Telegraph Department.

MR. BENNETT H. BROUGH.

ALL members of the Iron and Steel Institute, and, in fact, all those engaged either directly or indirectly in the manufacture of steel, were shocked by the sudden and unexpected death of Mr. Bennett Brough, the general secretary of the Iron and Steel Institute at Newcastle-on-Tyne, on Saturday last, after an operation for peritonitis. He had been attending the autumn meeting of the Institute in Middlesbrough, and up to Thursday appeared to be in normal health, and was taking his usual active part in making the meeting a success.

Mr. Brough was born in 1860, and was educated at the City of London School, and after graduating at the Royal School of Mines was for some time a student at the Mining School at Clausthal. Some time after the completion of his student career at Clausthal, he was appointed instructor in mine surveying at the Royal School of Mines, and only resigned on his appointment as secretary to the Iron and Steel Institute in 1893.

As early as 1885 he acted as a juror at the Inventions Exhibition, was a member of the Mining and Metallurgical Committees of the British Section of the Paris Exhibition of 1889, and of the St. Louis Exhibition of 1904, and the success of the Iron and Steel Section at the Franco-British Exhibition is in no small degree due to his great organising ability and untiring efforts.

Mr. Brough was not only a sound technical man, but a brilliant linguist, and a man of very wide culture and extensive travel. His well-known book on mine surveying and numerous contributions to the various technical and learned societies are known all over the world, and he was an accepted authority on mining matters.

He acted as examiner in mining at the Royal School of Mines, the Glasgow University, and the University of Wales, and he was a member of the council of the Institution of Mining Engineers; he served on the council of the Institute of Chemistry and the Chemical Society, and was also a Knight of the Swedish Order of Wasa.

As general secretary of the Iron and Steel Institute there were few men more widely known in the metallurgical world, and none more universally esteemed and respected. He was equally accessible to the youngest as to the oldest member of the institute, extending the same courtesy and consideration to all. He was a man of few words, but many kindly deeds, and not only those who were privileged to number him amongst their friends, but all who knew him, have suffered an irreparable loss.

NOTES.

A SPELL of exceptionally brilliant and hot weather for so late in the year occurred over the whole of the British Islands during the last three days of September and the first four days of October, and in nearly all parts of the country previous records fail to show any shade temperatures as high for the corresponding period. At Greenwich the maximum readings exceeded 70° each day, and on the six days from September 29 to October 4 it was 75° or above, the absolutely highest temperature being 79°·9, on September 30. An examination of the Greenwich records from 1841 shows a temperature of 79°·2, on October 4, 1886, but there is no other reading higher than 78° so late in the season. At Nottingham 78° occurred on October 3, whilst the previous highest temperature during the month in the last thirty-five years is 75°, in 1895. At Bath 77° was registered on October 1 and 2, and the highest previous record for the month is 73°, in 1873. At Shields the reading was 77° on October 3, and the previous highest reading in October is 69°, in 1898. All previous records were also broken by 77° at Aberdeen, 76° at Jersey, Nairn, and Valencia, 75° at Holyhead, and 73° at Leith, between October 1 and 4. A feature of especial interest during the hot spell was the exceptionally warm nights, the thermometer commonly not falling below 60°. The Weekly Weather Summary for the period ending October 3, issued by the Meteorological Office, shows that the mean temperature was more than 11° in excess of the average in the north-east and north-west of England and in the Midland counties, whilst the sheltered thermometer registered 80° in all these districts. Much fog or mist occurred at night, and the air throughout the hot spell was exceedingly humid, the ground remaining damp all day where screened from the sun's rays. The primary cause of the hot weather was a quiet drift of southerly air from off the heated land in Spain and France, due to the prevalence of a region of high barometer readings over Germany. At Rochefort and Biarritz the sheltered thermometer registered 86° on October 2.

WE learn from the observatory department of the National Physical Laboratory that highly disturbed magnetic conditions prevailed there on September 29–30. A magnetic storm commenced suddenly about 1.32 a.m. on September 29. After 7.30 a.m. the curves were only slightly disturbed during a period of fully six hours, when fresh disturbance appeared. Considering the length of the interval, it was probably a case of two distinct magnetic storms. On this view, the first storm lasted about six hours, during which time the declination showed a range of 54′, while the ranges of horizontal force and vertical force were respectively about 225 γ and 160 γ (1 γ = 0·00001 C.G.S.). The second storm, commencing suddenly about 1.45 p.m. on September 29, continued until 7 a.m. or